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# Too Much of a Good Thing? A Field Study of Challenges in Business Intelligence Enabled Enterprise System Environments

W. Pinnington

*University of Salford*, [wpinnington@mac.com](mailto:wpinnington@mac.com)

Ben Light

*University of Salford*, [b.light@salford.ac.uk](mailto:b.light@salford.ac.uk)

Elaine Ferneley

*University of Salford*, [E.Ferneley@salford.ac.uk](mailto:E.Ferneley@salford.ac.uk)

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# TOO MUCH OF A GOOD THING? A FIELD STUDY OF CHALLENGES IN BUSINESS INTELLIGENCE ENABLED ENTERPRISE SYSTEM ENVIRONMENTS

Pinnington, William, Information Systems, Organisations and Society Research Centre,  
University of Salford, The Crescent, Manchester, M5 4WT, UK, wpinnington@mac.com

Light, Ben, Information Systems, Organisations and Society Research Centre, University of  
Salford, The Crescent, Manchester, M5 4WT, UK, b.light@salford.ac.uk

Ferneley, Elaine, Information Systems, Organisations and Society Research Centre, University of  
Salford, The Crescent, Manchester, M5 4WT, UK, e.ferneley@salford.ac.uk

## Abstract

*Enterprise systems are advocated on the basis that they provide a centralised data repository that can be mined at the end-user level to improve organisational performance. Superficially, the benefits appear to be tremendous – the end user is empowered to fully exploit the technology they have been provided with, and the developer is freed to focus on other IT management issues. Underlying this notion is an element of technological determinism; the assumption being that end user computing will have favourable outcomes. Through a field study of an organisation that has embraced enterprise systems and has leveraged business intelligence functionality, we discuss some of the challenge faced. Although we recognise the challenges are interwoven, we present them here in relation to notions of empowerment, training, data interpretation, support for usage and negotiating authoring. Our study provides insights into the delicate nature of balancing centralised and decentralised report authorship and the potential implications of managing enterprise systems enabled business intelligence environments.*

*Keywords: Enterprise systems, Business intelligence, End-user computing.*

## 1 INTRODUCTION

Packaged based enterprise systems are widely championed as providing integrated support for organisational practices such as sales, distribution, manufacturing, human resources and finance (Davenport, 1998; Klaus et al., 2000; Shanks and Seddon, 2000). It is argued that such packages replace large, diverse, disintegrated and ageing systems and that this facilitates increased confidence in organisational data and affords better decision making (Bannister, 2001). Indeed, despite the mounting evidence which shows that those in organisations are having difficulties in attaining integration through software configuration alone (Hanseth and Braa, 1998; Light, 2001; Pollock et al., 2003; Scott and Wagner, 2003; Grant et al., 2006), there are further studies which emphasise the role of customisation as a key method by which enterprise system packages are made to work locally (Light, 2005; Light and Wagner, 2006; Wagner et al., 2006). Where implemented, such packages have arguably become, in some shape or form, the centralised backbone of many organisations' core operations. It is now almost banal to suggest that enterprise system packages require significant resource investment and that the extraction of business value is a key managerial agenda item. However, the circumstances of this conclusion warrants further investigation. A central tenet of the reasoning for adopting enterprise system packages is their value as a central repository of data that can be mined by a diverse group of end-users across the organisation. Indeed, it has been further suggested that the normative literature often presents evidence of

a causal relationship between standardised enterprise package adoption and the integration of organisational knowledge activities (Pan et al., 2001). However, whilst those in organisations have clearly sought to maximise the benefits obtained from such a substantial financial investment, in the light of the many publicised enterprise system failures and problematic implementations, such as Hershey, Aero Group and Snap-On, (Scott and Vessey, 2000), Cadbury Schweppes (August, 1999), Dell (Fan et al., 2000), and most dramatically FoxMeyer (Bicknell, 1998), success is far from predictable. Given the maturing of enterprise system usage, several companies are now 'going beyond ERP' (Holland et al., 1999) and have reached, what might be seen as, a more sophisticated stage of usage (Holland and Light, 2001) where strategic value from data, rather than process automation/reconfiguration, is the goal.

With this in mind, this paper is concerned with a particular element of enterprise systems – the Business intelligence application which is primarily concerned with helping end users to extract useful information from data. Software vendors emphasise the way in which this software liberates individuals to self-service their reporting requirements (Sheina, 2005), actively encouraging end-user computing. Organisations implement business intelligence systems in order to empower their workforce, providing the tools by which an employee can author a report that meets their precise needs at a given point in time. This paper, through the use of a case study example, shows that this degree of technological determinism may disregard the challenging aspects of exposing data in this manner. We suggest that whilst some of these aspects can be mitigated through careful management, others cannot be ameliorated and must simply be endured. To begin, we consider user interactions with computing a little more generally to provide a lens through which we can reflect upon our findings later in the paper. We then introduce our approach to the research. Following this is an introduction to the case site and we then provide a thematic analysis of our findings. Finally, we summarise and conclude.

## **2 THE 'USER' AND COMPUTING**

End-user computing appears to be an obvious boon for end users and Information Systems (IS) developers. It empowers the end users who have domain knowledge to exploit derived data without having to utilise a conduit—thus enabling a more speedy response to the vicissitudes of organisational life. It is suggested for example, that the process of developing an application not only predisposes an end user developer to be more satisfied with the application than they would be if it were developed by another end user, but also leads them to perform better with the application than they would if it were developed by another end user (McGill, 2004). Also, it enables IS personnel to delegate simple tasks to users, freeing them to concentrate on more technically difficult developments. However, it has also been argued that its value is undermined when the question of productivity is raised (Barton, 2004) and questions have been raised about lack of user competence and the need to develop their computing skills to an appropriate level in order to afford themselves the possibility of self sufficiency (Huff et al., 1988). Munro et al. (1997) argue that user competence is multi-faceted; in that it relates to familiarity with end-user computing applications that can be achieved via training and skills acquisition and the notion of finesse, something that comes from experience gained over time as opposed to being formally taught. Thus although end user computing can be valuable, there are clearly potential drawbacks. We are interested in this dynamic in enterprise environments where end user computing has been embraced to extract business value from a significant investment. Underlying this, we argue, is the notion that end-user computing, in the form of user led business intelligence reporting, will improve operations. Yet, this is a little deterministic because it is well known that even with user involvement in the specification and development of computer applications, failure, however defined, can still occur and success is not guaranteed (Cavaye, 1995).

The problem with conceptualizations of user involvement, where linked to requirements gathering, is that the assumption is that it is a good thing to do because if all requirements can be attained then a working

system will result. This has been termed the design fallacy – the presumption that the primary solution to meeting user needs is to build up extensive knowledge about the specific context and purposes of various users and incorporate this into technology design (Stewart and Williams, 2005). Yet, Stewart and Williams argue such thinking privileges prior design, is simplistic and, importantly overlooks opportunities for intervention beyond any ‘formal’ design process. Indeed, elsewhere it has been argued that the reality is that organisational features are products of constant social negotiation and consensus building (Truex III et al., 1999). A further issue with such conceptualizations is that users are often atomized and representations of them in systems are created devoid of any activity non-ICT related activities they might perform (Lamb and Kling, 2003). In parallel to this, developers are often seen as objective experts whose aim is to build the best system possible. However, again, it is recognized that such views are simplistic and that development and use is loaded with power and politics (Markus, 1983; Franz and Robey, 1984; Yourdon, 1986; Markus and Bjørn-Andersen, 1987). Therefore, if we consider business intelligence, enterprise systems, ‘users’ and ‘developers’, we begin to see potential tensions particularly as related to the potentialities for managing the fixed/fluid nature of business intelligence requirements and the relationship of this to so called user and developer roles. Such configurations require the acknowledgement of the ongoing work that ‘users’ put into sociotechnical systems in situ (Rohracher, 2005; Stewart and Williams, 2005). Not only do they use such systems, they produce them in use too. Additionally, it is important to recognize the role and position of IS staff in this effort.

### **3 RESEARCH METHODOLOGY**

In order to gain rich insights into the social and political influences in business intelligence use we have adopted an interpretive case study approach (Walsham, 1995). The organisation described in the case study has been given the pseudonym, Epsilon. Epsilon is a United Kingdom (UK) based Food manufacturer and is part of a larger holding group which is one of the largest food manufacturing organisations in the UK and Ireland. Epsilon has an annual turnover of circa £200 million and about 1,000 employees. The group to which Epsilon reports has an annual turnover of circa £1.5bn and approximately 20,000 employees. Guided by Myers (1997) assertion that interpretive research should present the multiple viewpoints of those involved and their different problems, the research is based on the collection of both quantitative and qualitative data from a cross section of organisational actors at the field site. The organisational actors included Managerial and operational staff in the development function and a variety of operational and managerial users throughout the functional areas of the business. In total 48 individuals provided data over a 3 month period. The primary data collection technique was the interview and observation which helped us to understand the ‘reality’ within the client organisation. Questionnaires were also used to gather supporting additional qualitative and quantitative data regarding the phenomena at hand. Our analysis began by reading through the initial transcripts and questionnaire responses. This led us to see various issues regarding business intelligence and end-user computing challenges from developer and user perspectives. Within these categories we then identified recurring themes in each grouping. We found that certain themes within each grouping reappeared, but from a different perspective. We also cross checked themes that had appeared in the user category only to see if they appeared in the developer category and vice versa. This led to a revised set of themes which overrode the initial developer/user categorisation in favour of providing better insights into the challenges of business intelligence for end-user computing. We use these to structure the reporting of the interpretation of our findings next.

## 4 A FIELD STUDY OF BUSINESS INTELLIGENCE AT EPSILON

The staff of Epsilon have been using enterprise systems since the 1980s. In 1999 Epsilon implemented a new enterprise system called Geac System 21. Geac is a global enterprise software company which is not as well known as its competitors such as SAP and Oracle as it is more industry specific, being especially suited to food and clothing manufacturers. To make the enterprise system deliver 'business value' a business intelligence application was introduced. Staff created a Data Warehouse which is populated by ETL (Extract, Transform, and Load) software. The ETL extracts data from the enterprise system database tables, applies any transformations to the columns of the tables such as data-type changes, mergers, and concatenations and loads the 'cleansed' data into a database table in the Data Warehouse. ETL technologies are divided into two distinct varieties, *pull* technologies and *push* technologies. Pull technologies are the traditional ETL tools which load data by pulling it from the source and transferring it to the Data Warehouse. The push technology allows the source database to push data into the Data Warehouse as and when the transactions occur in real time so that users can make operational and tactical business decisions based on the latest information. The push approach also has the advantages of having less impact on network bandwidth as the data is trickle-fed, rather than 24 hours worth of data being stored and transferred as a whole. It also permits query offload, which means that the server and database can concentrate on servicing transactions rather than running queries resulting in significant improvements to on-line transaction processing performance. As a consequence of the clear advantages of push technology over pull technology, push technology is used wherever possible within Epsilon. It is only when the data is held outside of the IBM iSeries that pull technologies are employed.

Epsilon uses the Canadian Cognos business intelligence software and, at the time of data collection, Epsilon were moving from a distributed client based to a centralised web-based business intelligence implementation. The Cognos back-end was a single Windows/Intel server supporting user access to Cognos via Impromptu Web Reports and PowerPlay Web. It also supports client users who use PowerPlay Enterprise Server. Impromptu Web Reporting delivers a promptable reporting environment where the user receives the information they require in a variety of potential formats. PowerPlay is Cognos' on-line analytical processing tool. Client based users at Epsilon benefit from a functionally rich client version of PowerPlay making it difficult, according to IS staff, to migrate them to the more functionally simplified web version. Having explained the infrastructure underpinning business intelligence at Epsilon, we now proceed to discuss the challenges experienced as a result of using enterprise systems for the purposes they were intended - as was stated in the introduction - such packages are argued to facilitate increased confidence in organisational data, and afford better decision-making (Bannister, 2001).

### 4.1 User Empowerment

The first theme that emerged was the issue of user empowerment. The manager (Simon) who was responsible for the technical implementation of the business intelligence system was a proponent of end user control and configuration of business intelligence reports and believed that "*business intelligence should empower the user to get hold of information when they need it and in the format they need it.*" Simon recognised that giving the users the appropriate tools increases their ability to answer their own questions in a timely manner. However Simon acknowledged that there was reluctance on the behalf of some individuals to engage with end-user business intelligence applications, he identified two separate user (or non-user) types. Firstly the '*Technophobe ... someone who is afraid to use any technology. They are typically either nearing retirement and spent their formative years in the workplace before computers became commonplace or are new to the organisation and have not been shown how to use the organisation's IT for some reason*'. Secondly, the non-user who is '*Time Starved*', typically senior

employees who work in stressful and busy roles: *‘they delegate many of the simpler tasks to sub-ordinates and see end-user computing as simply another task which can be delegated’*. Whichever sub-class the non-user belongs to, the end result is the same, somebody else has to produce the information for them.

Simon’s senior business analyst (Matthew) was slightly more sceptical about empowering the user: *“To a point, it is possible to give power-users more freedom to write their own business intelligence but they still tend to write reports which are parochial, ill-conceived and hard to maintain. However, once you give a kid a lolly, you can’t take it away and so it’s hard to remove a tool without encountering resistance”*. Matthew further commented: *“In effect, a user who has mastered business intelligence reporting authoring sees it as a status symbol. Removing it will invoke a similar response to the removal of their mobile phone, company car or laptop”*. Matthew’s view suggests that a strategy of phased transfer to power user authored business intelligence reports may be more appropriate.

From an end-user perspective, the senior manager responsible for finance (Arthur) held a similar view to Simon believing that IS were unable to respond to ad hoc business intelligence reporting needs in a timely manner because they are not sufficiently resourced to do so would conflict with their other urgent responsibilities. However, due to Arthur’s role he was pressurised in to writing reports for other staff, again the theme of techno-phobic and time-starved users emerges: *“The Sales Director, Chris, is techno-phobic and doesn’t really appreciate how to use IT. He simply asks me for the information and I give it him. On the other hand ... Toby is time-starved—whilst he could write the report himself, he asks me to write the reports as it’s more efficient for him if I do so”*. There are issues here regarding the rational use of expertise and resource, whilst Arthur is technically able to write the requested bespoke resources it is unclear whether it is the most efficient use of his time or whether Chris and Toby should be more actively encouraged to write their own reports. The Production Manager (Terry) however expressed a desire to delegate some report writing back to the IT department: *“if all standard monthly reports could be completely automatically then this would free up staff to focus on analysing and checking the data rather than producing the reports”*. Terry added: *“this would permit much more insightful conclusions to be drawn from the data and reduce the possibility of manually introduced error”*. Yet, a relatively novice user expressed the desire for control and autonomy whilst simultaneously being seemingly unaware of the potential benefits of any existing IS produced standardised reports: *“[I] don’t use standard reports so would be against taking away access to write my own as this is clearly needed for my role. [I’ve] no idea what standard reports there are so have answered yes to more standard reports as there may be ones which are helpful to me.”*

## **4.2 User Training**

The second theme that emerged was that of user training. Some initial quantitative data was collected and this gives some context to the qualitative data that we will subsequently present. 68% of respondents classify themselves as intermediate users with only 5% claiming to be expert in the use of end-user computing business intelligence application. 27% regarded themselves as novice users. Asked to assess whether their general IS skills had prepared them for using business intelligence software 49% of end-users felt that their general IS skills were sufficient whilst 51% their IS skills were not sufficient or were unsure. Two thirds of our dataset stated that they had received formal business intelligence software training from a member of the business intelligence technical team whilst three quarters of the dataset also stated that they had received informal business intelligence software training from a colleague. Half felt adequately trained in business intelligence software, whilst a third felt they weren’t and the rest weren’t sure.

From the quantitative data a reasonable assessment may be that the end-users were broadly IT competent and that a reasonable level of business intelligence software training had been delivered yet the qualitative data did not support this view. For illustration consider the following quotes regarding formal business

intelligence software training: *“I feel frustrated by my lack of skills using business intelligence and know I would be able to be more productive if I had a wider range of report-building skills at my fingertips”*, this individual, who regarded themselves as an intermediate business intelligence software user, could see the benefit of being able to write bespoke reports yet did not feel they had the skills; *“The general skill level within the sales team specifically is pretty good. The business intelligence skill level is however relatively low, with the majority of the work being done by a couple of individuals. Structured business intelligence training for PowerPlay specifically is none existent but people are willing to let those experienced users continue to do all the work as it is easier than getting trained”*, this quote ties in with the information received from Arthur the Finance manager who appears to be informally delegated much report generation work by the sales force however it should be noted that structured training is available and this overarching reluctance to take responsibility for report generation maybe more to do the sales force culture. A high level of informal training was identified in the study, consider: *“I have never had any training on PowerPlay and as a result, I have relied on the person sitting next to me to help as I fumbled through the system. This has been typical of the process I have had to use for Epsilon specific systems”*, whilst this quote is of concern, the individual was a relatively new member of staff and hence the comment perhaps points in a need to ensure that business intelligence software training is an early agenda item for new recruits; *“I use PowerPlay information on a daily basis. However, I have not received any formal training—I am reliant on other people sourcing info from PowerPlay for me when required”*. Finally, as perhaps most poignantly consider: *“As these are user-authored many of [your] questions really relate to the quality of training and the ability of the author/user, rather than the quality of the software”* indeed, whilst training was offered the key question is whether user-produced business intelligence reports are generated using the ‘correct’ parameters and whether the results are interpreted correctly.

### 4.3 Interpretation of Data

The third issue that emerged was the issue of interpretation of data. The technical manager, Simon, again showed a positive attitude, regarding understanding of the business and understanding of the data as entwined: *“the more users get familiar with the information, the better they understand the business. The better they understand the business, the better they understand the context into which the information is situated”*. Here experience is cited as an enabler of finesse and finesse a proxy for understanding and Simon further proposed an example of this phenomenon in practice *“An experienced user in the Sales department will look at the same data as an inexperienced user in the Finance department and gain a different understanding”*. Simon identified another benefit of extensive end-user adoption of business intelligence; data quality and end-user identification of erroneous data which can be questioned rather than ignored. The assumption of course here being that the end-user would be able to identify erroneous data, know the appropriate channel to raise the issue through and would not be uncomfortable raising the issue for fear of being wrong. Simon did recognise these issues may exist: *“[there is] an increased potential for misinterpretation of the information presented”*.

Whilst the Financial manager, Arthur, had generally been less of an advocate of end-user generated reports preferring to generate reports on behalf of other users he did not wish to see report generation delegated to IS as they may not know the correct query parameters: *“if something needs doing fast, it needs doing by someone who is available and knows what to do. That generally isn’t an IS person. Knowledge holders should be able to control their own destiny/reporting and not be dependent on a team with a different agenda and measures”*. The issue of IS incapacity to understand the business was raised by another user: *“There aren’t enough expert PowerPlay users in Epsilon. Most members of the IS/IT team don’t understand how the business operates—only how the software operates, meaning they don’t understand what is needed. There is minimal Impromptu use as well and I don’t think IS know what is*

available either. Users need training on the technical side (how to do it, etc.), and also on the information side (where to find it, etc.). I don't think users get this from IS."

#### 4.4 Support for Usage

The fourth theme to emerge was that of support for business intelligence usage. The Cognos software was largely viewed in a positive light, for example: *"The only business intelligence developed report that I use is the daily sales report. It's well structured, easy to run and requires no maintenance from a user perspective"*. However Matthew, the senior business analyst, identified that poor end-user software usage resulted in disappointment: *"Users tend to write reports that aren't of high quality and that's a big problem."* In order to alleviate this issue, Matthew suggested limiting the provisioned bespoke report writing so that: *"... it's tailorable but nothing more—promptable reports are fine, but don't allow users to write their own reports"*. Furthermore, Matthew identified that there were significant time differences between the development time of an experienced report writer versus an inexperienced report writer, concluding that there was a clear argument for having specialist report writers in the organisation. However, ironically, should the creation of business intelligence reports become a function of IS then Matthew identified a number of support issues that may emerge *"if you go down the managed reports path, you must be careful not to make a rod for your own back. It is easy to imagine that this would cause the users to repeatedly approach the business intelligence team for reports on this that and the other"*. Thus, although support staff may want control of report writing, they want this on their own terms.

End-user concerns regarding the usage of business intelligence software were largely concerned with getting the software to work in an acceptable fashion: *"The only downside with the report is the robustness of it. It does tend to require re-running, currently on almost a daily basis."*; *"The only real problem with user authored reports is the time taken running some of the larger reports, and the time it takes to print any information. Presumably this is as a result of the amount of data in the reports"*; *"Time to use the reports is minimal — providing they are being opened after the cube [data warehouse] has updated! A number of times reports will open with N/A [in the cells] which requires them to be rebuilt"*. However, issues of support were really more concerned with the IS functions ability to deliver business intelligence and the appropriateness of them doing this: For example, one user told us: *"These [IS authored reports] should simply offer the information which the business has stated it requires, and should be stored in one place. This does not happen at the moment, so we regularly chase elusive information."* And another added: *"Sometimes Finance request reports to be written by the IS department. Often is the case that at the time of requesting the report Finance are not entirely sure if the end report will need tweaking. If the report does require tweaking then IS can be resistant to altering the report as this request was not in the 'original spec.' In some cases the report has not been tweaked by IS and consequently the report can not be issued—thus wasting the work IS has already put into the project. In addition, some reports that IS write have to be very flexible, and sometimes this is met with resistance e.g. the ability, via Cognos, to change between the budget and the forecast. Finance has to be very flexible and tailor information to the requirement of the changing business needs. If IS are to be responsible for writing reports then they need to adopt this sense of flexibility too. I need a report altering this week and have been informed that I need to e-mail my request and join a queue! When I used to run the same report on Adaytum I could do the changes myself which only took a couple of minutes."* Additionally another user commented: *"IS don't understand the business and aren't reactive enough to go wholly to IS Developed reports. There is a big case for creating a lot more of the IS Developed reports, as this would simplify usage for all users, expert or not. They would also be more robust. I don't think that IS have advertised IS Developed reports and they have an image of being too busy to react to any new requirements. [Consequently,] users will not request something unless it cannot be done another way."*



Thus, end-users at Epsilon sometimes felt that IS were not responsive enough in providing timely, context specific business intelligence.

#### 4.5 Negotiating Authoring Ownership

Finally, a challenge that is very much interwoven with the others is that of negotiating authorship of business intelligence. In general, most users felt that the reports that were developed by IS were easy to run, maintain and provided accurate data although sometimes report availability could be faster. Interestingly, most users also felt that the reports they authored were equally easy to run, maintain and provided useful information when they wanted it, however, it appears they traded off report generation effort and speed of processing on occasion. These ideas fed into our interest the arguments for who should own business intelligence authorship.

From the IS department, the business intelligence systems controller, Simon, was a proponent of end user control and believed that: *“business intelligence should empower the user to get hold of information when they need it and in the format they need it.”* Yet, the enterprise manager advocated getting the IS department to perform all the reporting. However, he recognized that very talented Power Users could have limited input into report design: *“not only can they be helpful in terms of understanding the business, they are very useful allies.”* his view being that limited Power User access would satisfy the business desire for input into the design process.

We found similar diversity among user beliefs about reporting authorship. Kristy saw that there was a number of advantages for adopting centralised reporting. The first advantage is that of performance. Kristy cites improvements in the timeliness and accuracy of IS authored business intelligence. In addition to those factors Kristy highlights the benefit of increased performance, namely it *“maximises the use of time, moving it away from creating reports towards understanding the information contained within the reports.”* Another advantage is described by Kristy as ‘User-Ease,’ meaning that there are consistent formats and consistent information provision, making it easier for users to understand the information contained in the reports. A third benefit is that of enabler. Kristy notes that increased centralised reporting *“aids the cultural change of departments as ‘report creators’ to departments of decision makers and influencers.”*

However, Kristy was also keen to identify the drawbacks of reduced end-user computing in business intelligence. Firstly, she notes that *“you can never standardise and automate all reporting as it would be too unwieldy with reports created for only a few users and with reports which constantly change.”* Far from the removal of end-user computing in business intelligence creating improved decision making, she argues that it would detract from decision making efficiency. Kristy cited an illustrative example to support this argument: *“During the Chutney review a few months ago, top line analysis of promotional investment indicated that promotions were not driving incremental sales and hence overall margin was down. Ad hoc reports were vital in determining that the cause was a decline in non-promotional sales on different Stock Keeping Units (SKUs) in different retailers.* Kristy’s example, illustrates that end-user computing can make amends for ill-conceived centralised reports. Finally, another user stated that: *“restricting access takes people away from the actual data, reducing their responsibility for it.”* For example, if a user is responsible for accurate forecasts is unable to check on an ad-hoc basis that the forecasts are correct, they are more likely to assume less responsibility for its accuracy. This balanced viewpoint creates the need to be able to determine when reporting should be ad-hoc and when it should be centralised. Kristy felt that centralised reporting was most appropriate when reports: had an audience greater than two people; were required regularly, i.e. weekly, monthly, or quarterly; contained fairly static content. Other users broadly supported Kristy’s view as one user stated: *“If standardised reporting enabled me to find all the information I required, I would be happy with this.”* And another: *“IS developed reporting saves time throughout the business (in other businesses), as managers are not*

*spending time trying to find the information they want, but rather are analysing and formulating plans based on the analysis. Currently, different sites, and managers have different views on what information is required, and we have a plethora of ad-hoc reports and a few useful standard reports, but none of these do the job that is required for the business. In order to simplify the way we work and make better use of time, the senior management of the business needs to agree on what information will be needed and on what frequency. [Then] the reports should be created to meet that need. This removes the requirement for yet another user report which is time consuming to create, and will be discarded within the month! Alternatively, we should have a more user friendly system which allows much easier access to data, and easier interface with other systems, so people can access the data they require, when they require it. The current systems simply do not allow that as they are some of the most user unfriendly systems I have ever had to use."*

However, although users generally felt that there was utility in centralised reports, some also saw the need for user led reporting in certain circumstances: *"I do believe that we need to have more standardised reports across the business. This ensures that everybody is reporting against the same measures. On the flip side, in my role it is vital to be able to develop ad-hoc reports due to the nature of the role."* ... *"User authored reports are needed for promotional analysis and for running reports which are in line with our customer financial year as well as the Epsilon financial year. The removal of user reports would prevent this analysis. [In terms of the] pros for IS developed reports, [they] reduce the duplication of reports written and would no doubt speed up the system operation. More time can be spent using data rather than retrieving data."* Indeed some preferred only using end-user developed reports: *"I hardly use the IS developed business intelligence reports, but where I do, I take the data off the report with no further work. I'm not always happy that all the data I need is on a developed business intelligence report, but it has been excluded and I cannot get the data quickly from elsewhere. I don't know how you go about getting things changed in IS developed reports."* In this case the user was unsure about how to get centralised reports changed as so they made their own. In another case, the IS department was not approached as the end-user felt they could deliver what was required to their team more effectively: *"If I couldn't access user-authored reports I would experience some serious problems in my current role. I rely on these reports for the vast majority of my reporting to my team. They have been doctored in a way my team find useful. This doctoring may only be suited to my team and therefore user-authored business intelligence reporting is essential."* This line of argument was put forward by several other users: *"Within the sales and marketing function we have to do a lot of ad-hoc number interrogating to understand why what is happening, is happening—either positively or negatively. Taking away this ability will result in one or two Cognos users having to pick this up. Sometimes the interrogation is a very top-line report that should not be delegated as it is outside of the core, mainstream, reports that are designed for account managers and commercial accountants. When I joined the business, along time ago, we had no easily available business intelligence reporting functionality. Removing this ability from users will revert us back to this situation."* Some further argued that the business intelligence team would need to be expanded and implied that they wouldn't be interested in providing very specific authoring services: *"User requirements are many and varied—the business intelligence team would have to be considerably larger if it were to cope with all those ad-hoc requests. [Also,] the people doing that job would be pretty bored as most of it would be low level stuff. Also non business intelligence people would become more inefficient if we had to wait for business intelligence to do the entire minor jobs we do ourselves."*

## 5 SUMMARY AND CONCLUSIONS

Business intelligence applications are sold as leveraging value from the significant investments made in enterprise systems. Give the growing library of insights into ERP implementation; we were keen to join in the stream of research which sheds light on how such artefacts are made to work in practice. In our

case, we have done this by focussing upon the enactment of end-user computing in the area of business intelligence. However, given the contradictory outcomes of end-user computing and user involvement in the specification and development of computer applications, we were keen to avoid any deterministic assessment of its value. Despite business intelligence applications being made to allow ongoing work to implemented artifacts, we still see elements of the design fallacy in existence. In our case this is reflected in the tension between the need to fix business intelligence requirements whilst simultaneously requiring a degree of fluidity. The controller of the IS department sees this, as do many of the users, however certain IS staff appear to be caught up in the design fallacy. They wish to fix reporting and confine user interactions to standards and thereby limit any ongoing work that they might need to perform in situ. Indeed, within our field study, it appeared that several IS staff felt they could extract user knowledge and codify it for them to make it more usable, and easier for them to maintain. This despite the fact it has also been argued that use of user developed applications requires substantial end user knowledge because of the lack of separation of data and processing that is commonly found (Hall, 1996). (Stewart and Williams, 2005) argue such design fallacy oriented thinking privileges prior design, is simplistic and, importantly overlooks opportunities for intervention beyond any 'formal' design process. The findings of our field work, lead us to concur. Further, we show that, as has been argued elsewhere, constant social negotiation and consensus building in systems development is required (Truex III et al., 1999). Yet, this is further undertaken in an environment where users and developers have more at stake than their interactions with technologies (Markus, 1983; Lamb and Kling, 2003).

*Table 1. Potential Influences on the Negotiation of Authorship Considerations*

	Negotiation of Authorship Considerations	
	End User	IS Function
Empowerment	<ul style="list-style-type: none"> <li>• End users should control business intelligence authorship</li> <li>• Not all users want to be empowered</li> <li>• Some users see the need for some centralised reporting</li> <li>• Some users see the need for local reporting</li> </ul>	<ul style="list-style-type: none"> <li>• The IS function should author business intelligence reports on behalf of the user</li> <li>• The problem is once given to users, business intelligence tools are difficult to take away</li> <li>• Users can see business intelligence tools as status symbols</li> <li>• Some 'power users' might be allies</li> </ul>
Training	<ul style="list-style-type: none"> <li>• Users may require training to use the software</li> <li>• Users may demand more extensive training as their capabilities evolve</li> <li>• Informal training may act as a surrogate for formal training</li> </ul>	<ul style="list-style-type: none"> <li>• Users do not have the requisite skills to use business intelligence software properly it is the IS function's role</li> </ul>
Interpretation of data	<ul style="list-style-type: none"> <li>• Users know the business and are the ones that know the data</li> </ul>	<ul style="list-style-type: none"> <li>• Users do not have the right data interpretation skills</li> </ul>
Support for Usage	<ul style="list-style-type: none"> <li>• Users may trade a degree of finesse in report writing for obtaining a report when they require it</li> <li>• The IS function may not be responsive enough in terms of time and report individualisation</li> </ul>	<ul style="list-style-type: none"> <li>• Where the IS function controls authorship, standardisation is key</li> </ul>

Our field study thus provides insights into the challenges that users and developers face in enterprise systems environments with end user facing business intelligence applications. We identify five interwoven challenges concerned with user empowerment, training, data interpretation, support for usage, and negotiating authorship. Moreover, we suggest that negotiating authorship is a central consideration from a

practitioner perspective which appears to be influenced by whether or not various users want authorship responsibility, and if so, in what areas. Furthermore, consideration of the need for training of users in authorship applications appears necessary. Data interpretation capabilities also plays a part – both with respect to the abilities of users to interpret data they might generate and regarding the IS personnel having the skills and credibility to translate user requests regarding particular organisational contexts accurately. Finally, negotiations may be influenced by perceptions of the IS functions' ability and desire to support usage and user satisfaction their own capabilities given the business pressures they face. A summary of the potential interplays between the challenges is shown in Table 1. Future work will aim to expand the study to other organisations, providing further refinement to the potential influences framework.

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